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- (71) Applicant (*for all designated States except US*): **CMA BUSINESS CREDIT SERVICES** [US/US]; 40 East Verdugo Avenue, Burbank, CA 91502 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **OKAMOTO, Steve, Atsushi** [US/US]; 5512 Calle de Arboles, Torrance, CA 90505 (US). **SCHATTMAIER, Steven, Miller** [US/US]; 3 Winterhaven, Irvine, CA 92614 (US). **VON KAENEL, Tim** [US/US]; 12 Lake View Drive, Cote de Caza, CA 92679 (US). **ZEILE, Mike, Todd** [US/US]; 27627 Harwick Place, Valencia, CA 91354 (US).
- (74) Agents: **NIXON, Dale, B.** et al.; Sidley & Austin, Suite 3400, 717 N. Harwood, Dallas, TX 75201 (US).
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(54) Title: METHOD AND APPARATUS FOR GENERATING A VALUE BEARING INSTRUMENT

(57) Abstract:

METHOD AND APPARATUS FOR GENERATING A VALUE BEARING INSTRUMENT

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

5 This invention relates to the field of computer software, and more particularly to a method and apparatus for generating a value-bearing instrument.

2. BACKGROUND

A. Value Bearing Instruments

10 A value-bearing instrument is an item that has an intrinsic value and thereby represents a right to a valued item or service. Examples of such value-bearing instruments include currency, coupons, tickets, gift certificates, money order, and traveler's checks. A problem with value-bearing instruments is that it is inconvenient to transfer such instruments from one party to another. In most instances value-bearing instruments are exchanged via a physical transfer of the instrument itself. For example, a donor gives a gift certificate to a recipient by
15 physically providing it to the recipient. Thus, there is a need for a system that allows users to transfer an authenticated version of a value-bearing instrument from one party to another without requiring that a physical version of the instrument be exchanged and/or forwarded to the recipient.

20 Most commercial transactions involve the use of value-bearing instruments. A problem with such transactions is that current value-bearing instruments lack flexibility. For example, transferring a value-bearing instrument (e.g., a concert ticket) requires the holder of the instrument to physically send the value-bearing instrument to the recipient. If, after receipt, the value-bearing instrument is lost or destroyed the recipient has little recourse. In some instances, loss of the value-bearing instrument results in a permanent deprivation of the
25 right associated with the instrument.

Modern commerce lacks a secure and convenient form for creating, storing, and managing value-bearing instruments. Current methods to reissue, transfer, resell, void, and verify value-bearing instruments are fraught with security and management problems. As a result, there is a need for a system that provides a mechanism to generate and manage value-bearing instruments. Current systems, for example, lack a method for regenerating and/or revoking authenticated copies of a value-bearing instrument. Additionally, such systems lack a method for managing the organization, assignment, and printing of such instruments. A user cannot, for example, print an authenticated version of a value-bearing instrument from a personal computer.

Current mechanisms for managing value-bearing instruments are configured to generate one original. Such systems do not retain a digital representation of the value-bearing instrument that may be subsequently modified, transferred, and/or managed via a network interface.

B. General Background Material About Computer Networks

In order to facilitate an understanding of how computer networks allows for the transfer of data a brief discussion about such networks is provided. Computers and computer networks are used to exchange information in many fields such as media, commerce, and telecommunications, for example. The exchange of information between computers typically occurs between a "server application" that provides information or services, and a "client application" or device that receives the provided information and services. Multiple server applications are sometimes available on a "system server" such as a single computer server that provides services for multiple clients. Alternatively, distributed server systems allow a single client to obtain services from applications residing on multiple servers. For example, in current distributed server systems, client applications are able to communicate with server applications executing on the same computer system or on another computer system accessible via a network, for instance via the Internet.

The Internet is a worldwide network of interconnected computers. An Internet client computer accesses a computer on the network via an Internet provider. An Internet provider is an organization that provides a client (computer) with access to the Internet (via analog

telephone line or Integrated Services Digital Network line, for example). A client can, for example, read information from, download a file from, or send an electronic mail message to another computer/client using the Internet.

To retrieve a file or service on the Internet, a client must typically search for the file or service, make a connection to the computer on which the file or service is stored, and download the file or access the service. Each of these steps may involve a separate application and access to multiple, dissimilar computer systems (e.g. Computer systems having operating different systems). The World Wide Web (WWW) was developed to provide a simpler, more uniform means for accessing information on the Internet.

The components of the WWW include browser software, network links, servers, and WWW protocols. The browser software, or browser, is a tool for displaying a user-friendly interface (i.e., front-end) that simplifies user access to content (information and services) on the WWW. Browsers use standard WWW protocols to access content on remote computers running WWW server processes. A browser allows a user to communicate a request to a WWW server without having to use the more obscure addressing scheme of the underlying Internet. A browser typically provides a graphical user interface (GUI) for displaying information and receiving input. Examples of browsers currently available include Netscape Navigator and Communicator, and Microsoft Internet Explorer.

WWW browsers and servers communicate over network links using standardized messages formats called protocols. The most common modern protocol is the TCP/IP (Transmission Control Protocol/Internet Protocol) protocol suite. The protocols are based on the OSI (Open Systems Interconnect) seven-layered network communication model. WWW messages are primarily encoded using Hypertext Transport Protocol (HTTP). HTTP instantiates the (top) Application layer of the OSI model. Application layer protocols facilitate remote access and resource sharing and are supported by the reliable communications ensured by the lower layers of the communications model. Therefore, HTTP simplifies remote access and resource sharing between clients and servers while providing reliable messaging on the WWW.

Information servers maintain the information on the WWW and are capable of processing client requests. HTTP has communication methods that allow clients to request data from a server and send information to the server.

To submit a request, the client browser contacts the HTTP server and transmits the request to the HTTP server. The request contains the communication method requested for the transaction (e.g., GET an object from the server or POST data to an object on the server). The HTTP server responds to the client by sending a status of the request and the requested
5 information. The connection is then terminated between the client and the HTTP server.

A client request, therefore, consists of establishing a connection between the client and the HTTP server, performing the request, and terminating the connection. The HTTP server typically does not retain any information about the request after the connection has been terminated. That is, a client can make several requests of an HTTP server, but each individual
10 request is treated independent of any other request.

The WWW employs an addressing scheme that uniquely identifies Internet resources (e.g., HTTP server, file, or program) to clients and servers. This addressing scheme is called the Uniform Resource Locator (URL). A URL represents the Internet address of a resource on the WWW. The URL contains information about the protocol, Internet domain name and
15 addressing port of the site on which the server is running. It also identifies the location of the resource in the file structure of the server.

HTTP provides a mechanism of associating a URL address with active text. A browser generally displays active text as underlined and color-coded. When activated (by a mouse click, for example) the active text causes the browser to send a client request for a resource to
20 the server indicated in the text's associated URL address. This mechanism is called a hyperlink. Hyperlinks provides the ability to create links within a document to move directly to other information. A hyperlink can request information stored on the current server or information from a remote server.

If the client requests a file, the HTTP server locates the file and sends it to the client.

25 An HTTP server also has the ability to delegate work to gateway programs. The Common Gateway Interface (CGI) specification defines a mechanism by which HTTP servers communicate with gateway programs. A gateway program is referenced using a URL. The HTTP server activates the program specified in the URL and uses CGI mechanisms to pass program data sent by the client to the gateway program. Data is passed from the server to the
30 gateway program via command-line arguments, standard input, or environment variables. The

gateway program processes the data and returns its response to the server using CGI (via standard output, for example). The server forwards the data to the client using the HTTP.

When a browser displays information to a user it is typically as pages or documents (referred to as "web pages"). The document encoding language used to define the format for display of a Web page is called Hypertext Markup Language (HTML). A sever sends a Web
5 page to a client in HTML format. The browser program interprets the HTML and displays the Web page in a format based on the control tag information in the HTML.

Current network systems provide a way to transfer and display data. However, these network systems have left the delivery of value-bearing instruments to traditional mechanisms
10 such as mail, will call, and kiosks. The prior art therefore lacks a network system that provides a way to securely deliver, exchange, forward, and/or manage value-bearing instruments.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates the process utilized by one embodiment of the invention to generate
15 a ticket and provide a ticket to a user.

Figure 2 generally illustrates the elements of the system as utilized by one embodiment of the invention.

Figure 3 shows one possible structure of a database utilized by one embodiment of the invention.

20 Figure 4a illustrates an example implementation of one embodiment of the invention.

Figure 4b illustrates the elements of a ticket as generated by one embodiment of the invention.

Figure 5 shows the how the elements utilized in one embodiment of the invention interconnect.

25 Figure 6 illustrates the process utilized by one embodiment of the invention to securely generate and print a ticket via a network connection.

Figure 7 illustrates the elements utilized by one embodiment of the invention to securely generate and print a ticket via a network connection.

Figure 8 illustrates how an embodiment of the invention can be implemented as computer software in the form of computer readable program code executed on one or more general-purpose computers.

SUMMARY OF THE INVENTION

5 One embodiment of the present invention comprises a method and apparatus for generating a value-bearing instrument. The system provides transaction services that let users and vendors securely exchange funds and value-bearing instruments.

 The present invention provides users the conveniences of electronic transactions, and provides the security of authenticated exchange of funds for goods or services. Users of the
10 invention may, among other options, electronically maintain funds on account, exchange purchases with a vendor or other party, auction purchases on the secondary market, restore a lost or destroyed item, create a transaction to be claimed in the future, or forward a purchase to another party.

 The present invention provides vendors the ability to authenticate transactions the user
15 has made with the invention. If the user generates a value-bearing instrument created with the invention, the vendor is able to interact with the invention to ensure that the generated instrument is authentic. Vendors may use the invention to, among other options, advertise additional goods and services, void transactions, give refunds, create a series of transactions with the user, or offer returned goods or services for resale.

20 The invention comprises a number of elements that could be physically distributed and connected through a network such as the public Internet or Virtual Private Networks. This invention does not define any requirements on the physical form of these connections except to require certain security requirements on the connections as described later in the invention. While certain interactions between these system elements are illustrated, this invention does
25 not preclude other interactions between system elements.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is a method and apparatus for generating a value-bearing instrument. In the following description, numerous specific details are set forth to provide a more thorough description of the present invention. It will be apparent, however, to one skilled in the art, that the present invention may be practiced without these specific details. In other instances, well known features have not been described in detail so as not to obscure the present invention. Hereinafter, the term "system" is used to refer to a device and/or a method for performing a function that embodies the invention.

Hereinafter, the term Internet and/or network refers to any type of interconnection fabric that provides computers with a mechanism for transmitting and/or receiving data (e.g., intranets, local area networks, wide area networks, wireless networks, distributed server systems, or client/server architectures).

In one or more embodiments of the invention, an interconnection fabric comprises any of multiple suitable communication paths for carrying data between multiple computational devices. The interconnect fabric may be, for example, a local area network implemented as an Ethernet network, a virtual private network, or any other type of interconnect cable of sending data from one device to another. The interconnect fabric may be implemented with a physical medium such as a wire or fiber optic cable, or it may be implemented in a wireless environment.

In this document, the term ticket is utilized as an example of a value-bearing instrument. The invention, however, contemplates the use of any type of value-bearing instrument that may be redeemed for something of value. Value-bearing instruments comprise, for example, tickets, coupons, gift certificates, money orders, traveler's checks, and other forms of digital content having an intrinsic value. In one embodiment of the invention, value-bearing instruments may contain embedded data such as a document, music, videos, advertisements, and/or other types of digital information.

General Overview:

Figure 1 illustrates the process utilized by one embodiment of the invention to generate a ticket and provide a ticket to a user. The process initiates at step 100 where the user visits a ticketing interface that contains an interface for selecting and purchasing an event ticket. The user may access the ticket interface via a web browser, a kiosk, or any other mechanism that can display an appropriate interface to a user. In this embodiment, information associated with the ticket is stored on the ticket as indicium. However, other embodiments of the invention may use other methods of storing or recording such information. Hereinafter, the term "secure content" will be used to describe a manifestation of a binary string which represents secure data associated with a value-bearing instrument.

In one embodiment of the invention, the user's web browser is switched to a secure web page hosted by a Ticketing Services System (TSS). The TSS provides a secure data tunnel between the TSS and the user's system via a network.

In one embodiment of the invention, a Secure Transaction Service System (STSS) provides security between the STSS, the Ticket Services System, and the user system. In one embodiment of the invention, the STSS can secure communications between the STSS and the Ticketing Services System by using a secure connection (e.g., 128 bit SSL). Connections between the STSS and the user system are also secure, but may utilize varying forms and/or strengths of security (e.g., differing levels of encryption). Information stored in the STSS is also electronically secure. The hardware and software systems that comprise the STSS are physically protected in a vaulted facility. The STSS maintains a digital certificate for each user that is protected by that user's unique id, password, and shared secret. STSS supports the ability to associate the user with specific client hardware, and security rules related to the user's client hardware can be enforced. Before a user is permitted to access the ticketing interface, the user typically registers with the system (e.g., the first time the user wishes to purchase a ticket). During registration, the user determines the user id, password, and shared secret stored in the STSS. Each subsequent use of the system requires input of the user's id and password. The system will check to see if the version presented by the user matches the version stored in the STSS. In one embodiment of the invention, the STSS validates the

user's client hardware during the registration process and maintains a record of the hardware associated with a particular user.

In one embodiment, other information associated with the user, for example, the user's name, address, credit card or other identifying information is stored in a secure database as a user record. Each user record is associated with a unique digital certificate assigned to the user. The digital certificate is used to create a unique digital signature for each transaction and its associated value-bearing instrument, and therefore allows the ability to trace back each transaction to a certain user. The invention records the unique digital signature generated from each user's unique digital certificate along with other ticket content and/or demographic information on the ticket in the form of a manifestation of a secure binary string of data that is representative of value bearing instrument, such as a two dimensional indicium.

Once the registration process is complete, and the user has an account on the system, the user may log in to the Ticketing Services System. The secure data tunnels and other connections associated with the user's request for the ticket interface are established by the TSS during step 100. At step 102, the TSS presents a list of available tickets to the user. The list may be customized to present certain types of lists and may contain graphical representations of each item in the list. For example, the TSS may present the user with a list of events that will occur during the month of March. The invention contemplates generating lists based on preferences specified by the user and/or preferences derived from data about the user. Once the user peruses through the list and selects a ticket for purchase, step 104 executes.

At step 104, the TSS obtains purchase information from the user and determines whether the information presented is valid. If, for example, the user presents a credit card, the system verifies the credit card information and obtains an approval code. The system verifies the purchase information, then transmits confirmation data to the user (e.g., step 106) and displays a list of delivery options (e.g., step 108). In accordance with one embodiment of the invention the delivery options the system presents comprises a mail option, a reserve option, and a generate-now option. The invention also contemplates other options such as delivery to an electronic device (e.g., a cell phone or PDA).

The user may select a delivery preference and the system will provide the selected item (e.g., the ticket) via the preferred method. The ticketing service system, through a secure data

connection, passes the ticket content to the STSS. A physical and digital version of the ticket is generated by the STSS. In one embodiment of the invention, the ticket comprises secure content that contains a digital signature and/or any other information requested or required by the ticket service system. The secure ticket content comprises information that relates to the transaction being performed. For example, the ticket may contain a seating assignment, an event date, a customer name, and/or any other type of information the ticket producer wishes to include. An embodiment of the invention contemplates sale and/or use of available space on the ticket. For example, the providing entity may incorporate advertisements, coupons, and maps on the ticket or on any other type of value-bearing instrument. The ticket may also comprise information associated with the utilization of pre-paid services and/or information related to the acquisition of products, merchandise, and/or services. In some instances, the ticket comprises a product itself (e.g., if the ticket/value-bearing instrument is a form of currency, a secured instrument, or a stock certificate). The ticketing service system is designed to specify to the STSS which data elements will appear on the ticket as human readable text and which data elements are represented as machine readable secure content.

The user selects, via the TSS, a delivery method after generating a ticket. At step 110, for example, the system determines if the user elected to have the ticket delivered via mail. If so, step 112 executes and the ticket is delivered via mail. The term mail comprises an electronic mail and/or delivery via a postal system such as the U.S. Postal System. If the user did not pick delivery via mail, step 114 executes and the system determines if the user selected the reserve option. If the user selected the reserve option, the system executes step 116, where it provides the ticket and/or the ticket data to a reservation system. The intended recipient of the ticket may acquire the ticket by obtaining it from the reservation system. In one embodiment of the invention, the ticket is delivered to the reservation system electronically and may be obtained from the system when the intended recipient requests delivery of it. If the user did not select the reserve option, the STSS determines whether the user selected the generate-now option (e.g., step 118). In one embodiment of the invention, the generate-now option provides the user with a mechanism for generating the selected item (e.g., printing a ticket directly to the user's personal printer.) If the generate-now command is not selected, the TSS continues to display the list of delivery options, until the user chooses one. If the user does not select a delivery option, but instead exits the program, the STSS may

use a default delivery option. If, however, the user does select the generate-now option then steps 120 and 122 execute. At step 120, the STSS transmits the ticket data to the user's computer via a network. Once the ticket data resides on the user's computer, it is output to a printer. The invention may also transmit a value-bearing instrument to other types of devices,
5 such as a PDA or cell phone.

System Elements:

Figure 2 illustrates generally the elements of the system (shown as boxes with thick borders) as utilized by one embodiment of the invention. The system comprises STSS 200, user system 202, ticketing services system 204, and ticket verifier system 206. Functional
10 elements associated with the system elements are shown as boxes with thin lines. The connections between the system elements (shown as thick arrows) show possible logical connections between the system elements although in some instances other logical connections may exist. The system elements are assumed secure, and communication between the system elements is achieved through a secure communications channel that mutually authenticates the
15 parties (e.g., SSL or some other secure protocol suite). These system elements may be physically distributed and connected through a network such as the public Internet, a virtual private network, or any other interconnection fabric configured to allow computers to send and receive data. This invention does not define any requirements on the physical form of these connections except to require certain security requirements on the connections as
20 described later in the invention. While certain interactions between these system elements are illustrated, this invention does not preclude other interactions between system elements.

Each system element is configured to perform certain functions. The functions performed by one embodiment of the invention are discussed in further detail below. STSS 200 is configured to issue and distribute one or more tickets 208. Each ticket 208 comprises a
25 machine-readable portion and a human readable portion. The machine-readable portion allows ticket 208 to be uniquely identified. STSS 200 is also responsible for securely maintaining transaction records for transactions performed on the ticket. STSS comprises a transaction server 222 and numerous databases configured to support the system. STSS 200 may contain, for example, a user membership database 212, a transaction and ticket database 214, an

account database 216, a ticketing services database 218, and a ticket verifier database 220. A secure ticket generator 226, a ticket formatter 228, and an ad server 224 may also be integrated into STSS 200. In an embodiment of the invention, transaction server 222 interfaces with transaction logic module 230. Transaction logic module 230 is configured to obtain business rules from business rules module 232. STSS 200 also comprises auditing and reporting server 234 as well as billing and payment processing server 236.

In one embodiment of the invention, transaction server 222 provides the external interface with user system 202, ticketing services system 204, and ticket verifier system 206 so that each of these systems can request various ticketing transactions. The communication channel between transaction server 222 and these other system elements is assumed to be secure and mutually authenticated. Transaction server 222 is configured to dispatch transaction requests (e.g., a request for a ticket) to transaction logic module 230.

Transaction logic module 230 is configured to carry out the transactions associated with obtaining, generating, and/or verifying tickets. Transaction logic module 230 ensures that the transactions performed on the ticket are carried out to completion and that the appropriate databases are updated. As such, transaction logic module 230 coordinates the activities of other components that participate in execution of the transaction. In one embodiment of the invention, transaction logic module 230 is independent of a particular ticketing application. For example, transaction logic module 230 typically obtains application-specific instructions from business rules module 232.

Business rules module 232 enables the system to support a wide variety of ticketing applications. For example, event ticketing, coupon generation, or airline ticketing can all be considered different ticketing applications. As such, these different ticketing applications may require different actions to be taken by the system for a particular transaction. When a transaction is being processed by transaction logic module 230, business rules module 232 may, for example, determine the application associated with the transaction and provide instructions to perform various application-specific actions that are to be performed by transaction logic module 230. Business rules module 232 is a logical extension to transaction logic module 230. While transaction logic module 230 is generic and independent of specific ticketing application, business rules module 232 is capable of translating application specific semantics into generic form that transaction logic module 230 understands. Business rules

module 232 is capable of storing the logic associated with many different types of business transactions. Each set of logic has a unique identifier that can be used to specify the particular business rules to apply to the transaction being processed. The application specific business rules are input into business rules module 232 using a language capable of expressing the semantics of the business rules. Business rules module 232 can potentially support several such semantic languages.

Secure ticket generator 226 is configured to generate a ticket formatted for a specified ticket output apparatus. The ticket comprises secure content that can uniquely identify the ticket. Secure ticket generator 226 passes the ticket to ticket formatter 228, which in turn generates the formatted ticket for the ticket output apparatus (e.g., a printer).

Ticket formatter 228 component enables the system to control the placement of different content on the physical form of the ticket. For example, in one embodiment of this invention, a printed ticket comprises secure content, ticket information, advertisements, secure content for merchandise at a venue, and directions to the venue. Ticket formatter 228 is capable of storing many different formatting rules. Each has a unique identifier that can be used to specify the particular formatting rules to apply for a given ticket. The format rules and constraints are input into ticket formatter 228 using a language capable of expressing the semantics of the formatting rules. Ticket formatter 228 can potentially support several such semantic languages.

Ad server 224 interacts with ticket formatter 228 to provide advertisement content for the ticket. Ad server 224 can provide different ad content depending on the user or the particular venue that the ticket is intended for. The ad content rules and constraints are input into ticket formatter 228 using a language capable of expressing the semantics for ad selection. Ad server 224 can potentially support several such semantic languages.

Transaction and ticket database 214 is a secure database that keeps track of issued tickets and the state of the ticket. It also keeps track of all transactions performed on the ticket. There are several logical records in the database.

Figure 3 shows one possible structure of the database. However, the invention contemplates the user of other types of relational structures. Item record 300, in one embodiment of the invention, resides in transaction database 214 and represents each unique

good and service tracked by STSS 200. Each item record 300 may, for example, comprise the following information:

Item ID: A unique identification of the item (i.e., goods or services) generated by STSS 200.

5 Account: The account that is the current owner of the item.

Item State: The state of the item.

Item Group: Data provided by the TSS 204 to group like-items. Can be used to alter a group of records.

Item Data: Other data provided by the TSS 204 about the item.

10 Start Date: The date from which the invention assumes the item is valid.

Expiration date: The date on which the item and the associated ticket must be automatically deleted by the system.

Purge date: The date which the item and the associated ticket can be purged from transaction database 214.

15 STSS 200 creates ticket record 302 for each ticket it issues. Each ticket record 302 may, for example, comprise the following information:

Ticket ID: A unique identification of the ticket.

tem ID: Indicates what the ticket is for.

Account: The account that is associated with the ticket.

20 Ticket State: The state of the issued ticket.

TSS Ticket Content: The content of the ticket that Ticketing Service System 204 provided.

TSS Transaction Information: The content of the transaction provided by Ticketing Service System 204.

25 Ticket Output Format: The output format of the ticket.

Transaction Record 304 is created for each transaction issued by user system 202 or ticketing services system 206. Transaction record 304 may therefore be used for auditing, billing purposes as well as for recovery purposes. Each transaction record 304 may, for example, comprise the following:

30 Transaction ID: A unique identification of the transaction.

Transaction Type: The type of the transaction that was requested.

Transaction State: The state of the transaction e.g., pending, completed.

Target Ticket: Ticket ID for which the transaction is intended.

Source Ticket: Ticket ID for the source ticket if multiple tickets are involved in the transaction.

5 Transfer Authorization Record 306 is created by one embodiment of the invention whenever a ticket is in the process of being transferred. There are multiple kinds of transfer authorizations methods. For example, a transfer authorization may be a number, a digital signature or a user id. Transfer authorization 306 may, for example, comprise:

Transfer Authorization: Information used to authorize the ticket transfer.

10 Transfer Authorization Method: Indicates the particular method of authorization for transferring the ticket.

Account: The account that is associated with the transaction.

Ticket ID: The ID of the original ticket.

Transfer State: The state of the transfer authorization code: pending, transferred.

15 Accounting database 216 comprises a secure database configured to keep track of funds on behalf of the users for the purchase/refund of tickets, services, and merchandise. A user can be associated with several accounts with funds. The database also contains user-specific authentication data that enables the system to sign ticket content on behalf of the user. A unique digital certificate is generated for the user at the time of membership registration and
20 stored into accounting database 216.

 User membership database 212 keeps track of the users that have registered with the system. User membership database 212 typically contains general information about the user. Fields include, for example: unique user ID, user name, password, shared secret, email address, last user system (i.e., the id of the user system that was used last), and any other fields
25 the entity generating the database wished to collect.

 Ticketing services database 218 is configured to keep track of registered ticketing services. The database stores general information as well as authentication data to enable authenticated and secure communication between STSS and the ticketing services system 204. The fields of the database comprise, for example, the unique id of TSS 204, TSS 204
30 authentication data, email address of TSS 204, postal mailing address of TSS 204, and any other fields the entity generating the database wished to collect.

Ticket verifier database 220 keeps track of registered ticket verifier systems 206 by storing general information about each ticket verifier as well as authentication data to enable authenticated and secure communication between STSS 200 and ticket verifier system 206. The fields of the database may comprise, for example, the unique id of the verifier, verifier authentication data, email of the venue (if applicable), venue address, and any other fields the entity generating the database wished to collect.

Auditing and reporting server 234 enables external systems to generate auditing and other general reports about transactions that occur on the system. The client computer that communicates with the auditing and reporting server 234 of the server is, in one embodiment of the invention, an authenticated system. This precaution is intended to prevent unauthorized access to the data.

Billing and payment server 236 interfaces with the external billing and payment services to enable financial transactions to take place (e.g. credit card companies and/or banks). The client that communicates with the billing and payment server may be an authenticated system.

Customer support server 210 interfaces with the internal customer support systems to enable access to data and modification thereof on behalf of customers. The client that communicates with customer support server 210 may also be an authenticated system.

Ticketing services system 204 is an agent of the vendor who provides items of value that can be redeemed using a valid ticket. In one embodiment of the invention, ticketing services system 204 is capable of controlling ticket output apparatus 240. This is the case where ticketing services system 204 itself prints and distributes "secure" tickets with unique secure content added to the standard printed output. However, other systems (e.g., user system 202) may also transmit output to ticket output apparatus 240. Item database 242 optionally keeps track of goods, services and other items of value that the ticket can be redeemed for. Ticketing service system 204 typically maintains the database.

User system 202 provides user interface 244 that enables the user to perform various transactions associated with tickets such as issuing ticket 208. As such, it provides a mechanism for communicating with other system elements in carrying out the requested transactions. It also is capable of controlling ticket output apparatus 240 in the case where a physical form of the ticket needs to be generated (e.g. by printing ticket 208). User system

202 can be a PC with a Web browser and a printer. User system 202 can also be a mobile phone, personal digital assistant, smart card, or any other computer system configured to interface with STSS 200.

5 Ticket verifier system 206 typically resides at the location where the ticket is redeemed for goods and services. It has the capability to read the ticket information and, in some embodiments, to contact the STSS 200 to verify the validity of ticket 208. Ticket verifier system 206 is also capable of receiving the results of the ticket verification from transaction server 222, and take appropriate action based on the returned results.

10 The action taken by ticket verifier system 206 after receiving the results is application dependent. For example, ticket verifier system 206 may provide a user interface to the operator to display appropriate message to the operator. The component may also provide the interface to devices such as a gate or turnstile to control entry into a venue.

15 Ticket output apparatus 240 creates the physical form of the ticket. For example, a printer is a ticket output apparatus 240 for printing ticket, and/or any other value-bearing instrument, from a computer such as a PC. A smart card programming device could also be a ticket output apparatus 240.

Ticket input apparatus 246 reads the physical form of the ticket. For example, a scanner may act as ticket input apparatus 246 for printed tickets. A smart card reader may also be configured to acts as ticket input apparatus 246.

20 Figure 4A illustrates an example implementation of one embodiment of the invention. In this example, the system comprises multiple user systems 400, ticketing services system 408 and ticket verifier system 402. Each system is configured to interact with one another. In one embodiment of the invention, user system 400 may be a browser that is connected with the ticketing services system 408 and STSS 404. When user system 400 comprises a browser, 25 STSS 404 may download a plugin into user system 400 in order to provide additional security beyond what is available through the browser. This plugin can establish a secure connection to STSS 404.

User system 400 interacts with ticketing services system 408 to reserve or purchase something of value through a computer network such as the Internet. User system 400 then 30 communicates with STSS 404 to obtain ticket 418 and may use ticket output apparatus 442 to reduce ticket 418 to a tangible form. At the location where ticket 418 is redeemed, ticket

input apparatus 420 reads the ticket. Ticket verifier system 402 communicates with STSS 404 to verify ticket 418.

STSS 404 comprises a plurality of elements each configured to add functionality to the system. For example, STSS 404 may comprise the following elements: auditing and reporting
5 element 422, secure ticket generator 424, ad server 426, customer support server 428, business rule module 430, billing and payment server 432, ticket formatter 434, transaction server 414, transaction logic module 436, transaction and ticket database 438, user membership database 410, account database 412, ticketing services database 406, and ticket verifier database 440.

10 Figure 5 shows how one embodiment of the invention interconnects. For example, in this embodiment STSS 500, ticket verifier system 502, and ticketing services system 504 do not connect to one another through Internet 506. This invention, however, does not preclude utilizing the Internet to make such connection as long as transactions sent across such a network are secured. Browser 508, using secure plugin 510, however typically interfaces with
15 ticketing services system 504 via Internet 506. Once a ticket is generated it may be printed via printer 512. Thus, ticket 514 is a tangible representation of the ticket created by interfacing with ticketing services system 504. Ticket 514 may be verified by scanning the ticket with scanner 516. Scanner 516 communicates with ticket verifier system 502 to determine if the ticket is authentic (e.g., by verifying the digital signature associated with the ticket).

20 Data Objects

One embodiment of the invention comprises one or more data objects. Hereinafter the term “token” is used in its broadest sense, to indicate an element of data that may be comprised of one or more sub-elements.

TSS confirmation token (TCT) is an object that uniquely identifies the goods or
25 services that the user has reserved or purchased. The TSS confirmation token and detailed information about the transaction may be stored into the ticketing services database 406. The token can be a simple number, or some other digital form of information.

TSS ticket content (TTC) 452 (see e.g., Figure 4B) is an object comprising ticketing services system 408 specific information that will be recorded on a ticket. Ticketing services

system 408 and ticket verifier system 402 can interpret the content and act on the information. TSS ticket content objects fit into the ticket.

TSS transaction information (TTI) is an object comprising the data supplied by ticketing services system 408 that are to be interpreted by and acted upon by STSS 404. The data comprises:

Ticket Printable/Displayable Information: The specification as to what information is to be put into the output format of the ticket that can be visible to the user.

Verifier ID: One or more verifiers that can verify the ticket.

Item Data: Data to store into the Item Record. For example, Start Date, Expiration Date, Purge Date, Item Group.

Transaction system ticket content (TSTC) 450 object comprises content put into the ticket that is specific to STSS 404. The information may include, but is not limited to:

Secure Content version number.

Digital Signature Algorithm.

STSS ID: Uniquely identifies the transaction system that issued the ticket. It may be used in cases where there are multiple transaction systems on the network.

User ID: Identifies the user of the ticket.

TSS ID: ID of the TSS that supplied the ticket.

Item ID: The item to which the ticket is issued for.

Verifier ID: The verifier of the ticket.

Ticket ID: The ticket record for this ticket.

Ticket State: The state of the ticket.

Start Date.

Expiration Date.

Secure Content (SC) 454 object comprises the signed digital content of the secure content that is to be put into the ticket. Secure content may contain the following content:

$$\text{TSTC} + \text{TTC} + \text{SIG}_U (\text{TSTC} + \text{TTC}) \mid \text{S}_{\text{STSS}} (\text{TSTC} + \text{TTC} + \text{SIG}_U (\text{TSTC} + \text{TTC})).$$

Where the + indicates concatenation operation and | indicates an optional concatenation operation. $\text{S}_Y(X)$ represents the output of a digital signature function where message X is signed by entity Y. U refers to the user and STSS refers to STSS 404.

Secure content typically indicates which digital signature algorithm is used. Possible digital signature algorithms include, but are not limited to, the Digital Signature Standard (DSS) or the Elliptic Curve Digital Signature Algorithm. However, the invention contemplates the use of other methods for generating a digital signature.

5 Secure content for a ticket is typically formatted for a particular ticket output format. For example, for printed tickets, ticket secure content may take on the form of printable symbologies such as a 2-D barcode.

 In one embodiment of the invention, the ticket is formatted to support the particular ticket output format that is to be used. The format typically comprises a ticket secure content
10 and may include additional information requested by TSS 204. For example, TSS 204 may request that an advertisement be included in the printed form of the ticket.

Ticketing Transactions

 The following subsections describe various transactions and services that one embodiment of the invention associates with ticketing. It will be apparent to one skilled in the
15 art that the examples provided are not restricted to ticketing applications and may therefore be practiced on all types of value-bearing instruments, or any other form of digital content having an intrinsic value.

A. User Registration and Login

 Each user establishes a trusted relationship with ticketing service system 408 and STSS
20 404 in order to participate in various ticketing transactions. In one embodiment of the invention, the user accomplishes this by registering with ticketing service system 408 and STSS 404.

 User system 400, for example, may authenticate the user before it can participate in any transaction on behalf of the user. If the user has an account in user membership database 410,
25 user system 400 provides the user's authentication data to STSS 404 in order to establish the identity of the user. The authentication data could be, for example, a user name and password.

 If the user does not have an account, the user may register with STSS 404 to create one. The system will guide the user through the registration process. STSS 404, for example,
30 may request user system 400 to provide registration info and unique authentication data. The authentication data may include a unique user name, password and shared secret. A unique

digital certificate is generated for the user, and an account (i.e., an entry) is created in the account database 412. Following registration, the user logs in and proceeds with the transaction.

STSS 404 may elect to store the identification of the user system 400 that last accessed the user account in user membership database 410. If transaction server 414 detects that user system 400 is different from the one used last, the system will warn the user if the user account indicates that the user wants such a warning.

As part of the registration process, a software module may be downloaded into user system to facilitate future secure connection with STSS 404. For example, if user system 400 is a browser, a plugin may be downloaded into the browser.

B. Initial Instrument Generation (For example, secure printing via a network)

The invention, in one or more embodiments, provides the user a mechanism to generate an initial value-bearing instrument. Figure 6 illustrates the process utilized by one embodiment of the invention, where for example the user uses the invention to securely generate and print a ticket via an interconnection fabric. The sequence of events associated with the initial ticket issuance begins at step 600 where user system 700, on behalf of the user, interacts with ticketing services system 704 to purchase or reserve certain goods or services. (See figure 7.) In response, step 603 executes and ticketing services system 704 returns a *TSS confirmation token* and *TSS identification* for the transaction that occurred between the user and ticketing services system 704. A TSS confirmation token uniquely identifies an item that the user has reserved or purchased. Typically, the item is stored in an item database associated with ticketing services system 704. This TSS confirmation token and detailed information about the transaction is stored into a ticketing services database 406. The token can be formatted as a simple number, or some other structured, digital form of information.

At step 605, user system 700 establishes a secure connection to the STSS, and the two systems are mutually authenticated. Once the systems are authenticated, step 607 executes and user system 700 provides the user authentication information to STSS 702. STSS 702 authenticates the user. The authentication information could be a user name and a password.

After the user is authenticated, step 609 executes and user system 700 transmits a request for a ticket to STSS 702. For example, user system 700 may send a message to STSS 702 requesting that a ticket be issued for the transaction that the user had with ticketing

services system 704. The TSS confirmation token is typically provided with the message. The output format of the ticket the user wants may also be indicated. The output format, for example, can be a print-ready format appropriate for a printer. It could also be an output format appropriate for a smart card or personal digital appliance.

5 At step 611, STSS 702 and ticketing services system 704 connect and exchange ticket information. For example, STSS 702 may send a message to ticketing services system 704 requesting information about ticketing services system 704's transaction identified by the confirmation token. While the scenario described here assumes that the information is pulled from ticketing services system 704, ticketing services system 704 may be configured to push
10 the information onto STSS 702. Continuing at step 611, ticketing services system 704 returns the requested information. The information may comprise, but is not limited to:

 TSS Ticket Content (TTC): The content that is stored on the ticket. STSS does not interpret this data.

 TSS Transaction Information (TTI): The information that is required by and
15 interpreted by STSS 704.

 At step 615, STSS 702's transaction logic module performs the requested transaction and generates a ticket. To generate a ticket, a ticket generator creates a unique secure content with the digital signature of the user and the digital signature of the STSS. Ticket secure content, appropriate for the specified ticket output format, is created. A ticket output format
20 is created using a ticket formatter. The ticket output format is dependent on the ticket output format. A ticket output format may comprise visible data indicated by ticketing services system 704 to be included in the ticket. It could also include advertisement information. Once the ticket is generated the ticket is returned to user system 700 and the transaction and ticket database is updated appropriately. At step 617, user system 700 outputs ticket 706 using
25 ticket output apparatus 708. Note that ticketing services system 704 can also output ticket 706 directly.

 C. Value-Bearing Instrument Formatting (For example, a ticket comprising printed coupons, advertisements, and maps)

 Ticketing services system 204 communicates with STSS 200 to provide the formatting
30 rules to ticket formatter 228. The format rules and constraints are input into ticket formatter 228 using a language that expresses the semantics of the formatting rules. Ticket formatter

228 can potentially support several such semantic languages. Ticket formatter 228 also may include a database that contains additional information (e.g., maps).

Ad server 224 is also populated with different advertisement information. Ticketing service and item (e.g., venue) specific rules and constraints that specify the advertisement content are supplied.

When a new ticket needs to be generated, transaction logic module 230 instructs secure ticket generator 226 to generate ticket 208. Secure ticket generator 226 in turn instructs ticket formatter 228 to format the ticket based on the information supplied to it. Ad server 224 interacts with ticket formatter 228 to provide advertisement content for ticket 208.

In one embodiment of the invention, ad server 224 can provide different advertisement content depending on the user or the particular venue that the ticket is intended for. Ad server 224 may also provide data that relates to pre-paid services and/or products.

D. Embodiment of General Purpose Computer Environment

An embodiment of the invention can be implemented as computer software in the form of computer readable program code executed on one or more general-purpose computers such as the computer 800 illustrated in Figure 8. A keyboard 810 and mouse 811 are coupled to a bi-directional system bus 818 (e.g., PCI, ISA or other similar architecture). The keyboard and mouse are for introducing user input to the computer system and communicating that user input to central processing unit (CPU) 813. Other suitable input devices may be used in addition to, or in place of, the mouse 811 and keyboard 810. I/O (input/output) unit 819 coupled to bi-directional system bus 818 represents possible output devices such as a printer or an A/V (audio/video) device.

Computer 800 includes video memory 814, main memory 815, mass storage 812, and communication interface 820. All these devices are coupled to the bi-directional system bus 818 along with keyboard 810, mouse 811 and CPU 813. The mass storage 812 may include both fixed and removable media, such as magnetic, optical or magnetic optical storage systems or any other available mass storage technology. The system bus 818 provides a means for addressing video memory 814 or main memory 815. The system bus 818 also provides a

mechanism for the CPU to transferring data between and among the components, such as main memory 815, video memory 814 and mass storage 812.

In one embodiment of the invention, the CPU 813 is a microprocessor manufactured by Motorola, such as the 680X0 processor, an Intel Pentium III processor, or an UltraSparc processor from Sun Microsystems. However, any other suitable processor or computer may be utilized. Video memory 814 is a dual-ported video random access memory. One port of the video memory 814 is coupled to video accelerator 816. The video accelerator device 816 is used to drive a CRT (cathode ray tube), and LCD (Liquid Crystal Display), or TFT (Thin-Film Transistor) monitor 817. The video accelerator 816 is well known in the art and may be implemented by any suitable apparatus. This circuitry converts pixel data stored in video memory 814 to a signal suitable for use by monitor 817. The monitor 817 is a type of monitor suitable for displaying graphic images.

The computer 800 may also include a communication interface 820 coupled to the system bus 818. The communication interface 820 provides a two-way data communication coupling via a network link 821 to a network 822. For example, if the communication interface 820 is a modem, the communication interface 820 provides a data communication connection to a corresponding type of telephone line, which comprises part of a network link 821. If the communication interface 820 is a Network Interface Card (NIC), communication interface 820 provides a data communication connection via a network link 821 to a compatible network. Physical network links can include Ethernet, wireless, fiber optic, and cable television type links. In any such implementation, communication interface 820 sends and receives electrical, electromagnetic or optical signals which carry digital data streams representing various types of information.

The network link 821 typically provides data communication through one or more networks to other data devices. For example, network link 821 may provide a connection through local network 822 to a host computer 823 or to data equipment operated by an Internet Service Provider (ISP) 824. ISP 824 in turn provides data communication services through the world wide packet data communication network now commonly referred to as the "Internet" 825. Local network 822 and Internet 825 both use electrical, electromagnetic or optical signals that carry digital data streams to files. The signals through the various networks and the signals on network link 821 and through communication interface 820,

which carry the digital data to and from computer 800, are exemplary forms of carrier waves for transporting the digital information.

The computer 800 can send messages and receive data, including program code, through the network(s), network link 821, and communication interface 820. In the Internet
5 example, server 826 might transmit a requested code for an application program through Internet 825, ISP 824, local network 822 and communication interface 820.

The computer systems described above are for purposes of example only. An embodiment of the invention may be implemented in any type of computer system or programming or processing environment.

10 Thus, a method and apparatus for generating a value-bearing instrument in an Internet or client/server environment has been described. Particular embodiments described herein are illustrative only and should not limit the present invention thereby. The claims and their full scope of equivalents define the invention.

WHAT IS CLAIMED IS:

1. A computer system adapted for the sale of value-bearing instruments within an electronic network which is in communication with a user system, comprising:

a seller system programmed for:

5 (a) receiving an order for a value-bearing instrument from said user system for initiating a transaction between said user system and said seller system for said value-bearing instrument,

(b) sending a confirmation token corresponding to said transaction to said user system,

10 (c) sending information pertaining to said value-bearing instrument to a secure transaction service computer,

a secure transaction service computer programmed for:

(a) receiving said confirmation token from said user system,

(b) receiving said information pertaining to said value-bearing instrument from said seller system, wherein said information relates to said confirmation token,

15 (c) generating said value-bearing instrument using said information pertaining to said value-bearing instrument, and

(d) transmitting said generated value-bearing instrument to said user system.

2. A computer system adapted for the sale of value-bearing instruments as recited in Claim 1 wherein said secure transaction service computer is further programmed to send at least a portion of said confirmation token to said seller system and receive in response thereto said information pertaining to said value-bearing instrument from said seller system.

3. A computer system adapted for the sale of value-bearing instruments as recited in Claim 1 wherein said secure transaction service computer is further programmed for:

(a) storing a registration of said user, including identity information for said user, and

5 (b) receiving said identity information from said user system for authenticating the identity of said user.

4. A method for sale of value-bearing instruments through a computer network, comprising the steps of :

receiving an order for a value-bearing instrument from a user system by a seller system, wherein said order for said value-bearing instrument comprises a transaction between said user
5 system and said seller system,

sending a confirmation token corresponding to said transaction from said seller system to said user system,

receiving said confirmation token from said user system by a secure transaction service, wherein said user system is registered with said secure transaction service,

10 transferring value-bearing instrument information corresponding to said transaction from said seller system to said secure transaction service,

generating said value-bearing instrument by said secure transaction service by use of said value-bearing instrument information, and

15 transmitting said value-bearing instrument from said secure transaction service to said user system.

5. A method for sale of value-bearing instruments through a computer network as recited in Claim 4 wherein the step of transferring value-bearing instrument information corresponding to said transaction from said seller system to said secure transaction service comprises the steps of :

5 said secure transaction service sending said confirmation token to said seller system, and

said seller system sending said value-bearing instrument information to said secure transaction service in response to receipt of said confirmation token from said secure transaction service.

6. A method for sale of value-bearing instruments through a computer network as recited in Claim 4 wherein the step of transferring value-bearing instrument information corresponding to said transaction from said seller system to said secure transaction service comprises the steps of :

5 said seller system sending said value-bearing instrument information to said secure

transaction service in the absence of a request for said value-bearing instrument information from said secure transaction service.

7. A method for sale of value-bearing instruments through a computer network, comprising the steps of :

registering a user system with a secure transaction service, storing identification information corresponding to the user system at the secure transaction service and providing
5 the identification information to the user system,

receiving an order for a value-bearing instrument from said user system by a seller system, wherein said order for said value-bearing instrument comprises a transaction between said user system and said seller system,

10 sending a confirmation token corresponding to said transaction from said seller system to said user system,

receiving said confirmation token from said user system by said secure transaction service,

transferring value-bearing instrument information corresponding to said transaction from said seller system to said secure transaction service,

15 generating said value-bearing instrument by said secure transaction service by use of said value-bearing instrument information, and

transmitting said value-bearing instrument from said secure transaction service to said user system.

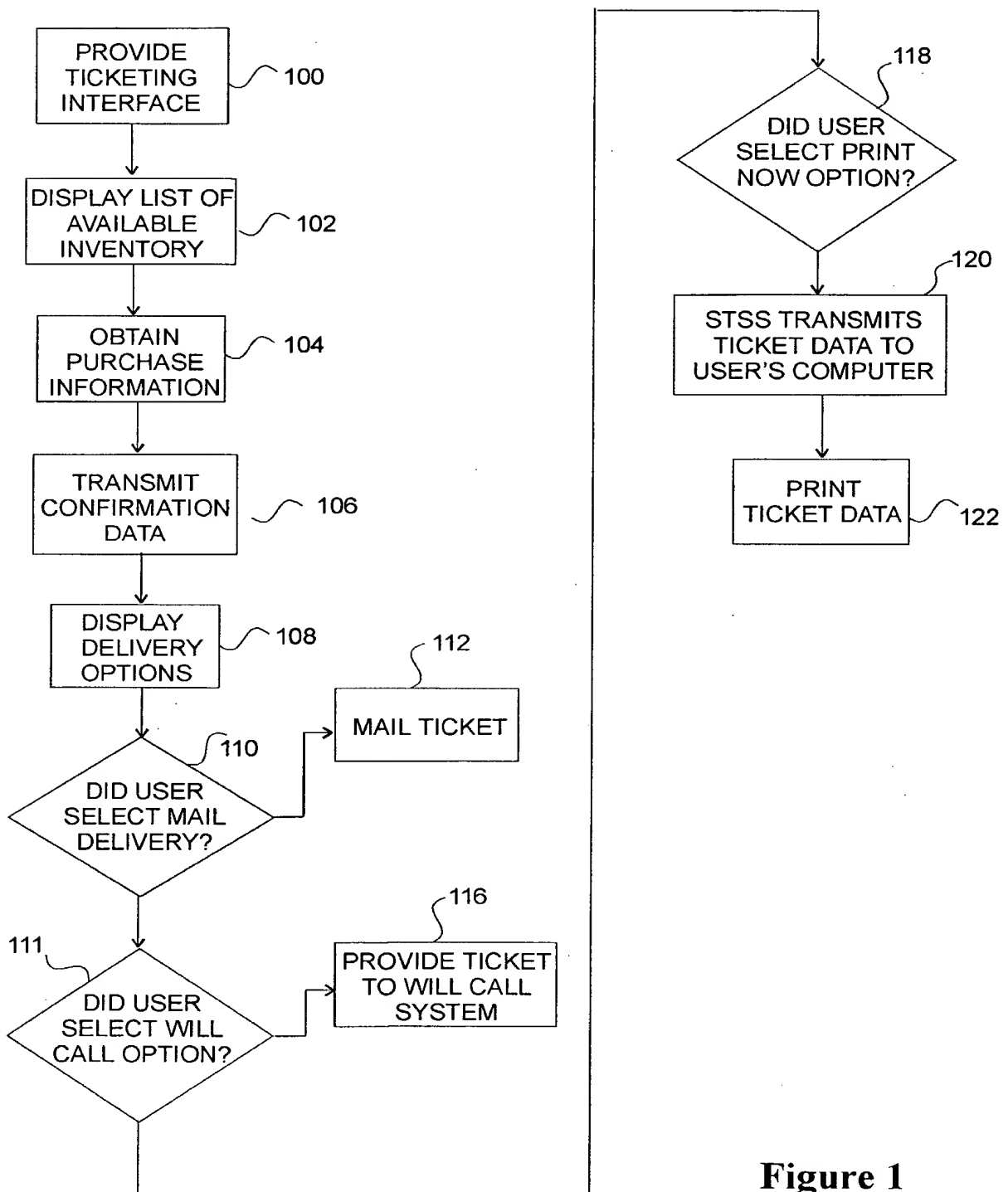
8. A method for sale of value-bearing instruments through a computer network as recited in Claim 7 wherein the step of transferring value-bearing instrument information corresponding to said transaction from said seller system to said secure transaction service comprises the steps of :

5 said secure transaction service sending said confirmation token to said seller system, and

said seller system sending said value-bearing instrument information to said secure transaction service in response to receipt of said confirmation token from said secure transaction service.

9. A method for sale of value-bearing instruments through a computer network as recited in Claim 7 wherein the step of transferring value-bearing instrument information corresponding to said transaction from said seller system to said secure transaction service comprises the steps of:

- 5 said seller system sending said value-bearing instrument information to said secure transaction service in the absence of a request for said value-bearing instrument information from said secure transaction service.

**Figure 1**

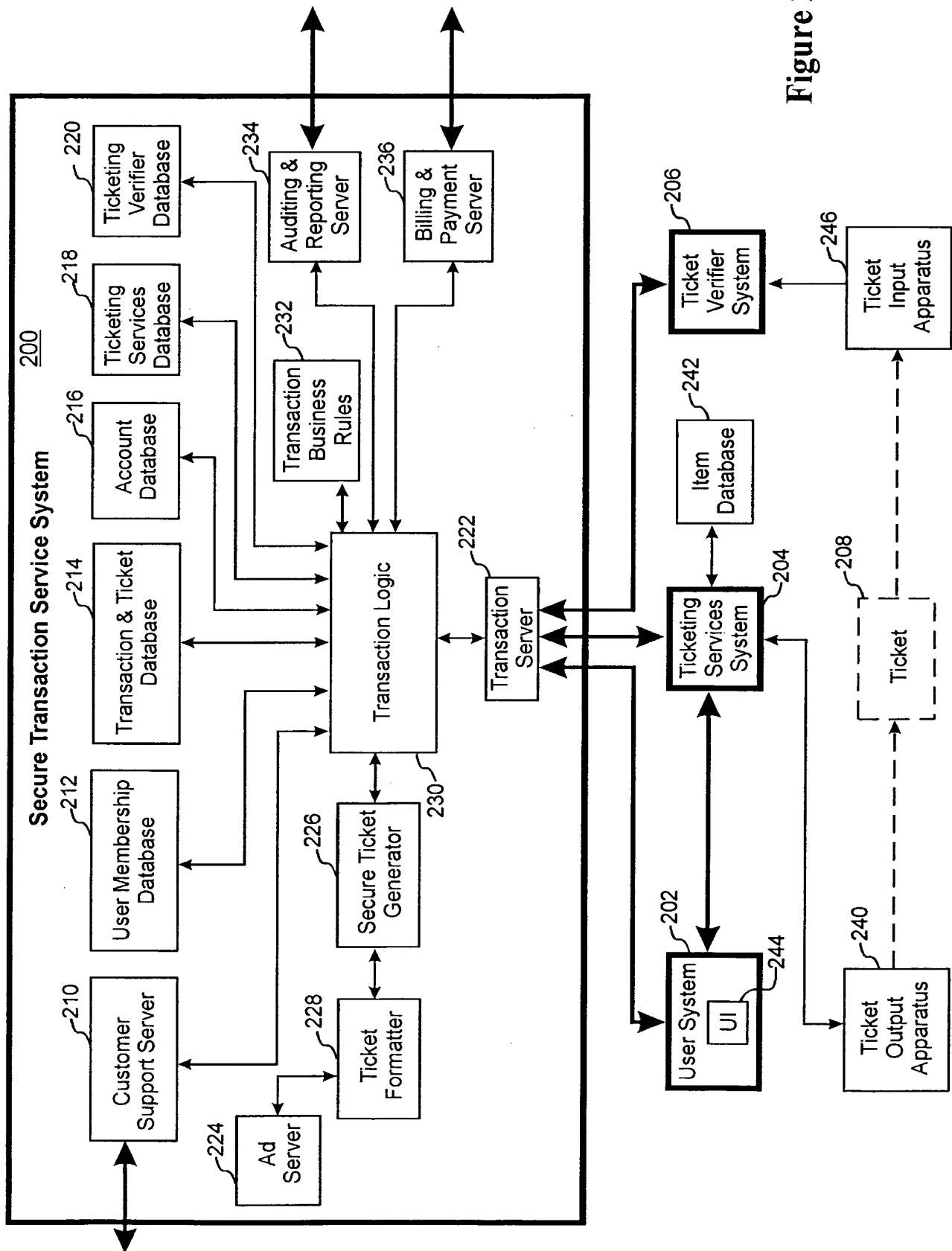
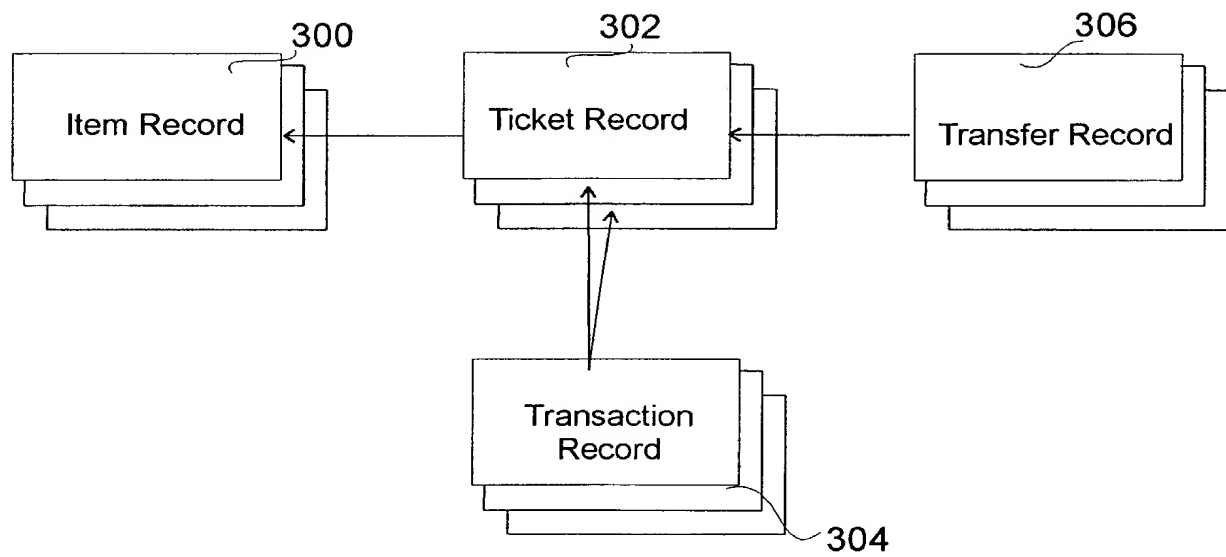


Figure 2

**Figure 3**

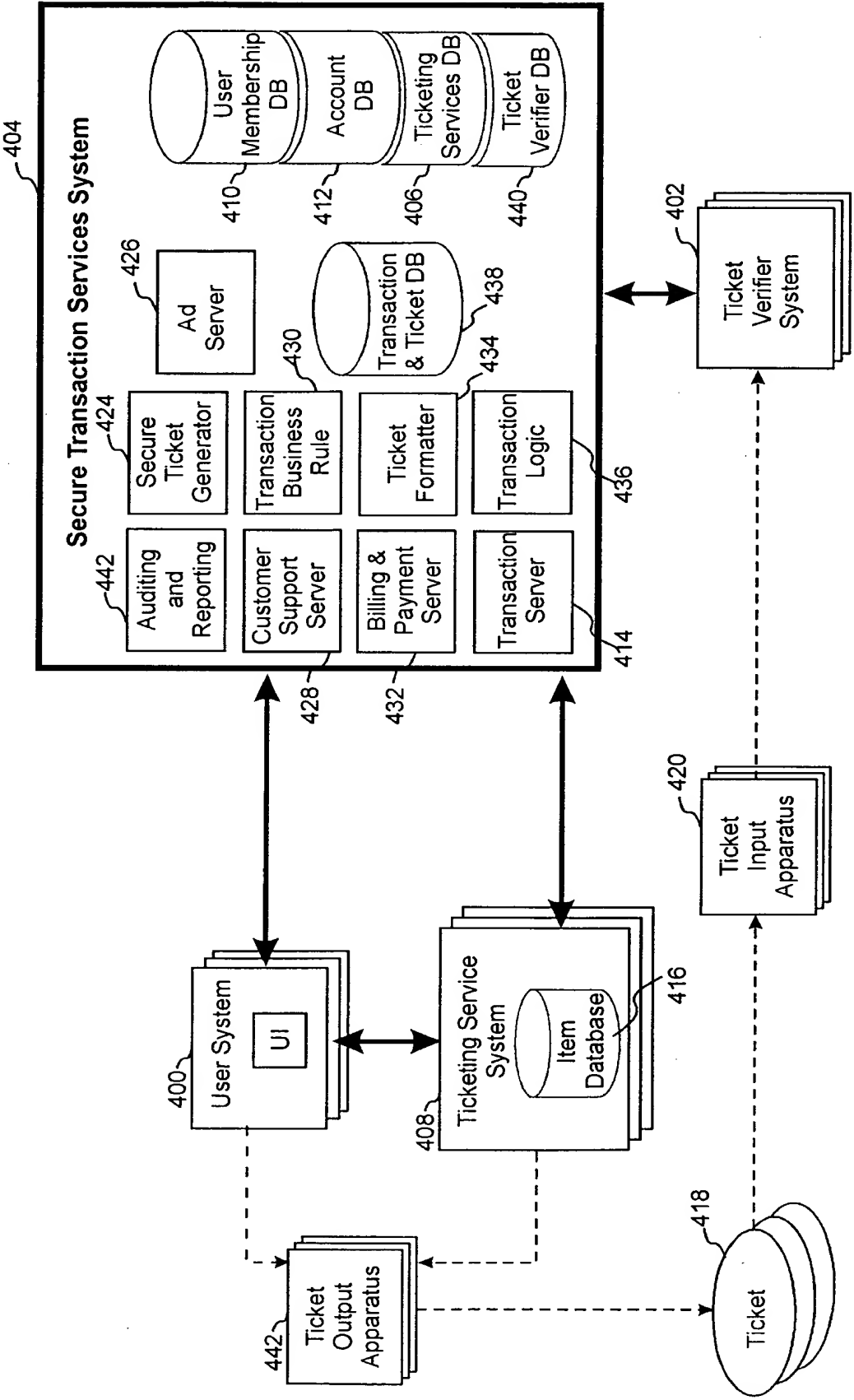


Figure 4A

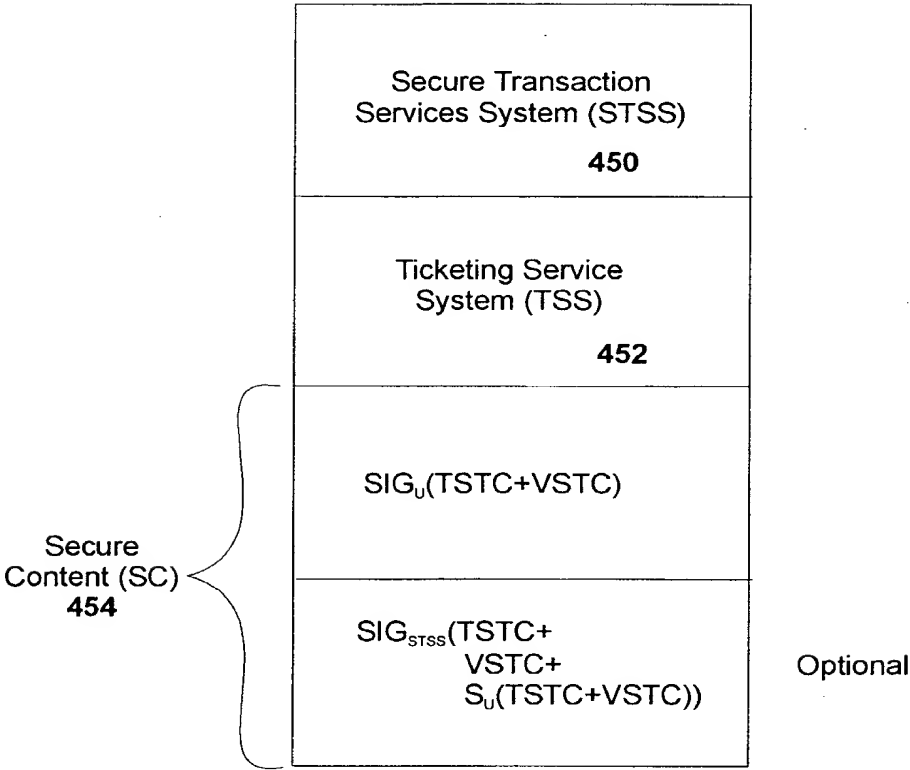
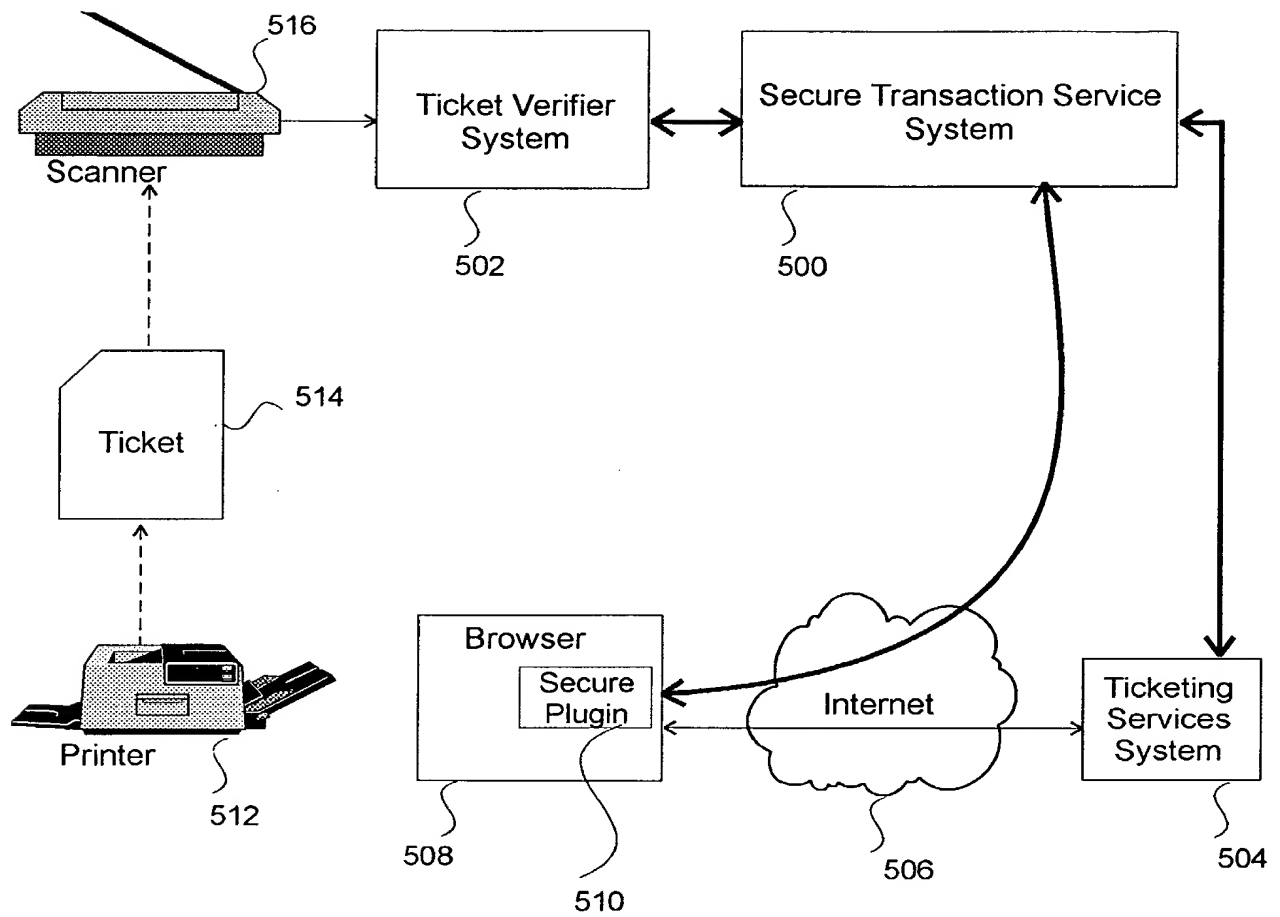
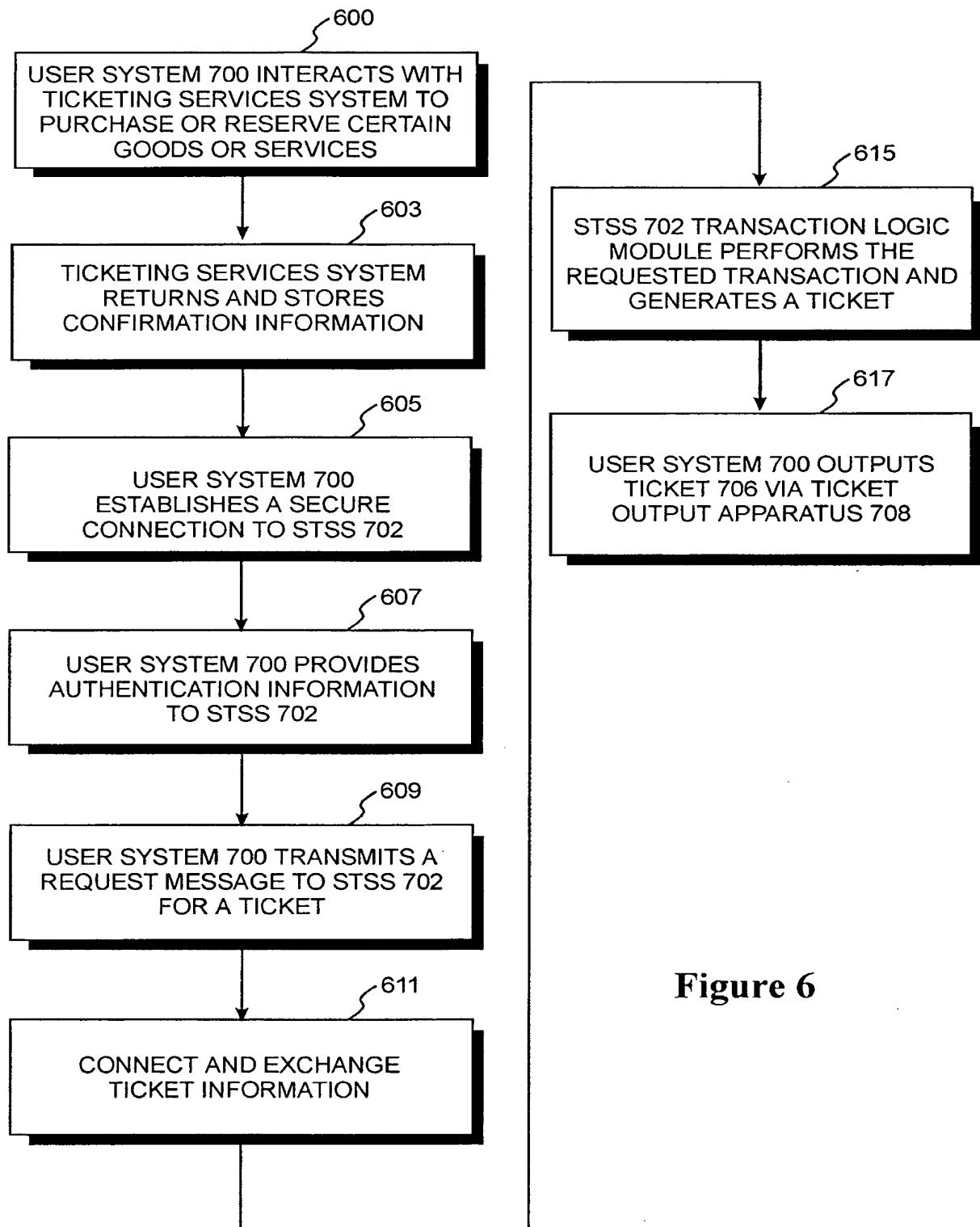


Figure 4B

**Figure 5**

**Figure 6**

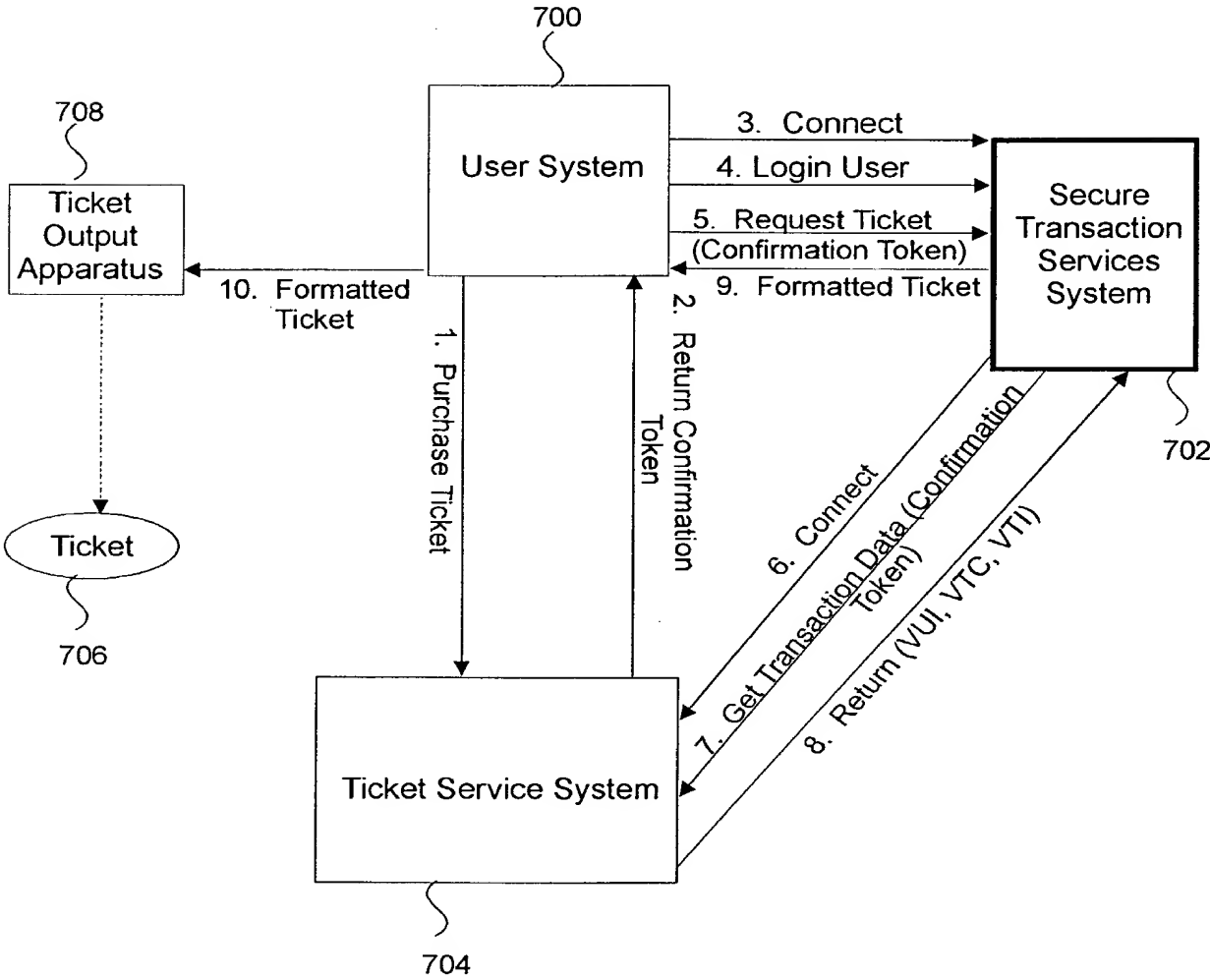


Figure 7

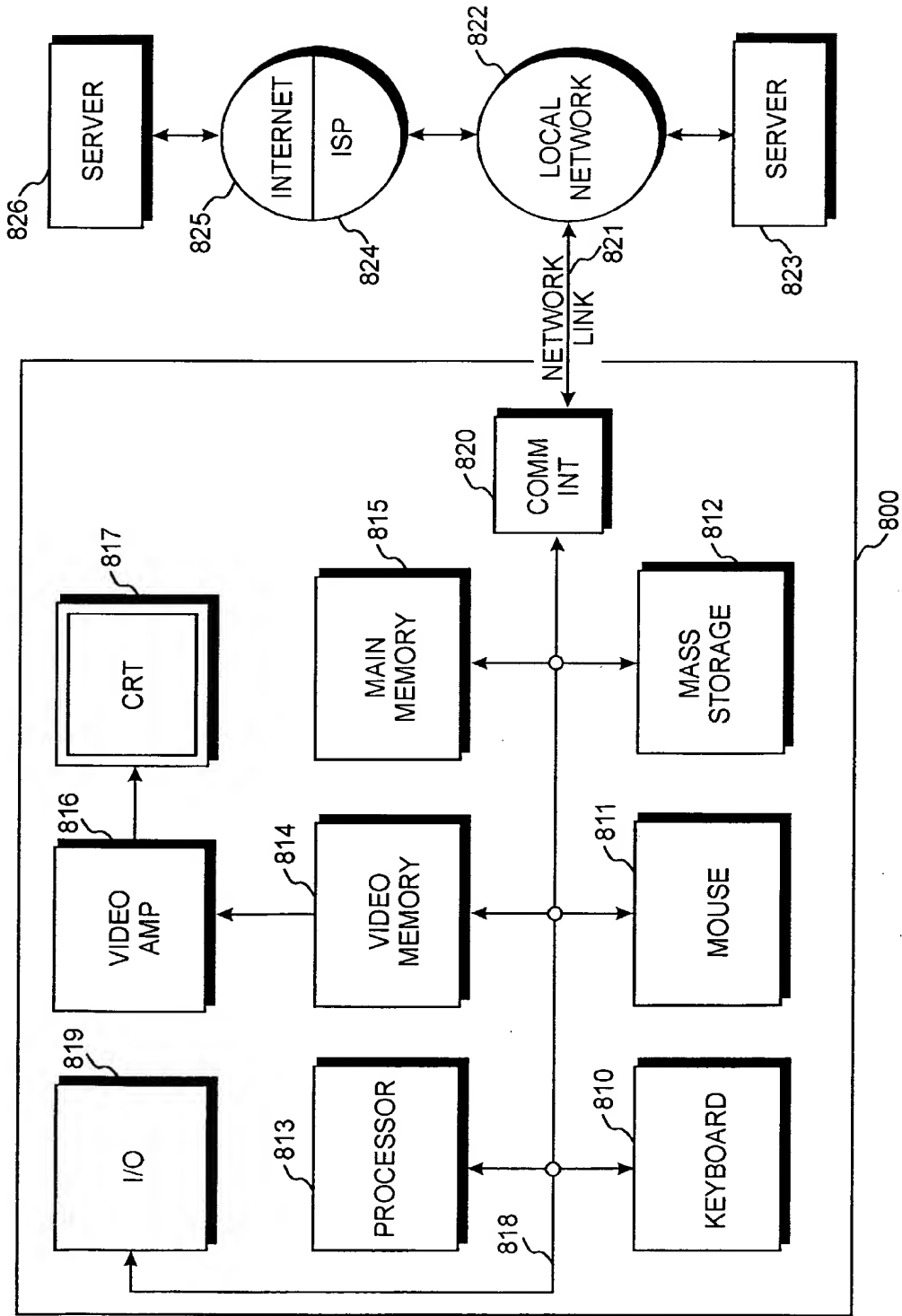


Figure 8

PATENT COOPERATION TREATY

PCT

DECLARATION OF NON-ESTABLISHMENT OF INTERNATIONAL SEARCH REPORT

(PCT Article 17(2)(a), Rules 13ter.1(c) and Rule 39)

Applicant's or agent's file reference 17406/00803	IMPORTANT DECLARATION	Date of mailing(day/month/year) 15/06/2001
International application No. PCT/US 01/ 10520	International filing date(day/month/year) 30/03/2001	(Earliest) Priority date(day/month/year) 29/03/2000
International Patent Classification (IPC) or both national classification and IPC G06F17/60		
Applicant CMA BUSINESS CREDIT SERVICES		

This International Searching Authority hereby declares, according to Article 17(2)(a), that **no international search report will be established** on the international application for the reasons indicated below

1. ☒ The subject matter of the international application relates to:
 - a. ☐ scientific theories.
 - b. ☐ mathematical theories
 - c. ☐ plant varieties.
 - d. ☐ animal varieties.
 - e. ☐ essentially biological processes for the production of plants and animals, other than microbiological processes and the products of such processes.
 - f. ☒ schemes, rules or methods of doing business.
 - g. ☐ schemes, rules or methods of performing purely mental acts.
 - h. ☐ schemes, rules or methods of playing games.
 - i. ☐ methods for treatment of the human body by surgery or therapy.
 - j. ☐ methods for treatment of the animal body by surgery or therapy.
 - k. ☐ diagnostic methods practised on the human or animal body.
 - l. ☐ mere presentations of information.
 - m. ☐ computer programs for which this International Searching Authority is not equipped to search prior art.

2. ☐ The failure of the following parts of the international application to comply with prescribed requirements prevents a meaningful search from being carried out:


☐ the description
☐ the claims
☐ the drawings

3. ☐ The failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions prevents a meaningful search from being carried out:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

4. Further comments:

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Mar' a Rodr' guez Nõvoa
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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 203

The subject-matter claimed in claims 4-9 falls under the provisions of Article 17(2)(a)(i) and Rule 39.1(iii), PCT, such subject-matter relating to a method of doing business.

Claims 1-3 relate to a conventional system for performing the business method of claims 4-9. Although these claims do not literally belong to the method category, they essentially claim protection for the same commercial effect as the method claims. The International Searching Authority considers that searching this subject-matter would serve no useful purpose. It is not at present apparent how the subject-matter of the present claims may be considered defensible in any subsequent examination phase in front of the EPO as International Preliminary Examining Authority with regard to the provisions of Article 33(1) PCT (novelty, inventive step); see also Guidelines B-VII, 1-6).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.